SEQUENCE LISTING

5

10

15

20

25

30

<110> Johnson & Johnson Research Pty Ltd <120> MODULATION OF CYTOCHROME P-450 REDUCTASE ACTIVITY IN POPPY PLANTS <130> 02 1377 1495 <160> 12 <170> PatentIn version 3.3 <210> 1 <211> 2318 <212> DNA <213> Papaver somniferum <400> 1 60 aggaaccatc acgactettt etetetetaa aateegetea egetttette ttettettgt 120 tcttcaatca gagctcacct gaatcaaaac acacagacac acaaaaaaat cattttctgg 180 tgattttttt gtttgaattt ttgggtgaag atttgaattc gatggagtca aattcgatga 240 aactattgat agttgattta atgtctgcaa ttttaaatgg gaaattagat caagcagatt 300 caattttaat agagaatcgt gagattttga tgatattgac tacagctata gccgttttta 360 ttggttgtgg tttcctttat atttggagaa gatcttttcg gaaatccagt aaaattgttg 420 aggacctaaa actggttgtt actaaagaac ctgaacctga aattgacgat ggtaaaaaga 480 aagttactat cttctttggt actcaaactg gtactgctga aggtttcgct aaagcacttt 540 ctgaagaagc aaaagcaaga tatgacaaag ctgtctttaa agtggttgat ctggatgatt 600 acgcagcaga tgatgatgag tttgaggaga aactaaaaaa agaaaattta gcgcttttct 660 ttttagctac gtacggagat ggtgaaccaa cagataatgc tgccagattt tataaatggt 720 ttacggaagt ggctaaagag aaggaaccat ggcttccgaa tcttaacttt ggtgtgtttg 780 gattgggaaa tagacagtat gagcatttca ataaggttgc aaaggttgtt gatgagatta 840 900 ttgttgaact gggtgggaaa cgtcttgttc ctgtgggtct tggagacgac gaccaatgta tagaagatga ctttacagca tggcgagagt tggtatggcc tgaattggat cagttgctcc 960

ttgatgaaaa tgattcaacg agtgtttcaa ccccttacgc tgctgctgta gcagaatata

1020

	gggtggtatt	ccatgattct	teggatgeat	ccctacaaga	caagaactgg	agtaatgcca	1080
	atggctatgc	tgtctatgat	gctctgcacc	catgcagaac	caatgtggct	gtaagaaggg	1140
	agcttcacac	tccagcttct	gatcgttctt	gtattcatct	ggaatttgac	atatcaggca	1200
5	ctgggcttac	gtatgaaact	ggagatcatg	ttggtgtcta	ctctgaaaac	tgcatggaaa	1260
	ctgtggagga	agcggaaaga	ttgttgggtc	tttcatcgga	cactgtattt	tctattcacg	1320
	tcgataacga	ggatgggaca	ccgatcgccg	gaagcgcatt	acctccccct	tttccctctc	1380
	ccagcacttt	aagaactgca	cttaccaaat	atgctgatct	attgaatttc	cccaagaagg	1440
10	ctgctctaca	tgctctagct	gctcatgcat	ctgatccaaa	ggaagctgag	cgattaagat	1500
	ttcttgcatc	tcctgctgga	aaggatgaat	atgcacagtg	ggtagttgca	agtcagagaa	1560
	gtctgctaga	agtcatggct	gaatttccat	cagctaaacc	tccacttggg	gtgttctttg	1620
	cagcaatagc	acctcggctg	cagcctagat	tctattcgat	ttcgtcctcc	aacaggatgg	1680
	caccctctag	aattcatgtc	acatgtgcgc	tagtgaatga	gagaacacca	gctggtcgaa	1740
15	ttcataaagg	agtctgttca	acctggatga	agaattctgt	tccttcggaa	gaaagccgtc	1800
	actgcagctg	ggcaccagtt	tttgtgagac	aatctaactt	caaactgcct	gctgattcta	1860
	cagtaccaat	tatcatgatt	ggccctggta	ctgggttggc	tcctttcaga	ggattcatgc	1920
	aggaacgact	tgctcttaag	gaagctggtg	tagaattggg	agctgcggtc	ctgttctttg	1980
	gatgcagaaa	cagaagcatg	gatttcattt	atgaagacga	gctgaacaac	tttgtcgagt	2040
20	caggtgctat	ctctgagttg	gtggtcgctt	tctcacgtga	gggtcctacc	aaagaatacg	2100
	tacaacataa	gatgacagag	aaggcttccg	acatctggaa	tatgatctct	cagggtgctt	2160
	atctttacgt	ctgtggtgat	gccaaaggca	tggccaagga	tgtgcatcga	actcttcaca	2220
	caattgttca	agagcaggga	tctttagaca	gctccaagac	tgaaatgttg	gtgaagaatc	2280
	tgcagatgga	tggaaggtat	ctacgtgatg	tctggtga			2318

<210> 2

25 <211> 698

<212> PRT

<213> Papaver somniferum

<400> 2

Met Glu Ser Asn Ser Met Lys Leu Leu Ile Val Asp Leu Met Ser Ala

30 1 5 10 15

Ile Leu Asn Gly Lys Leu Asp Gln Ala Asp Ser Ile Leu Ile Glu Asn Arg Glu Ile Leu Met Ile Leu Thr Thr Ala Ile Ala Val Phe Ile Gly Cys Gly Phe Leu Tyr Ile Trp Arg Arg Ser Phe Arg Lys Ser Ser Lys Ile Val Glu Asp Leu Lys Leu Val Val Thr Lys Glu Pro Glu Pro Glu Ile Asp Asp Gly Lys Lys Lys Val Thr Ile Phe Phe Gly Thr Gln Thr Gly Thr Ala Glu Gly Phe Ala Lys Ala Leu Ser Glu Glu Ala Lys Ala Arg Tyr Asp Lys Ala Val Phe Lys Val Val Asp Leu Asp Asp Tyr Ala Ala Asp Asp Glu Phe Glu Glu Lys Leu Lys Glu Asn Leu Ala Leu Phe Phe Leu Ala Thr Tyr Gly Asp Gly Glu Pro Thr Asp Asn Ala Ala Arg Phe Tyr Lys Trp Phe Thr Glu Val Ala Lys Glu Lys Glu Pro Trp Leu Pro Asn Leu Asn Phe Gly Val Phe Gly Leu Gly Asn Arg Gln Tyr Glu His Phe Asn Lys Val Ala Lys Val Val Asp Glu Ile Ile Val Glu Leu Gly Gly Lys Arg Leu Val Pro Val Gly Leu Gly Asp Asp Asp Gln Cys Ile Glu Asp Asp Phe Thr Ala Trp Arg Glu Leu Val Trp Pro

	Glu	Leu	Asp	Gln	Leu	Leu	Leu	Asp	Glu	Asn	Asp	Ser	Thr	Ser	Val	Ser
					245					250					255	
	Thr	Pro	Tyr	Ala	Ala	Ala	Val	Ala	Glu	Tyr	Arg	Val	Val	Phe	His	Asp
				260					265					270		
5	Ser	Ser	Asp	Ala	Ser	Leu	Gln	Asp	Lys	Asn	Trp	Ser	Asn	Ala	Asn	Gly
			275					280					285			
	Tyr	Ala	Val	Tyr	Asp	Ala	Leu	His	Pro	Cys	Arg	Thr	Asn	Val	Ala	Val
		290					295					300				
	Arg	Arg	Glu	Leu	His	Thr	Pro	Ala	Ser	Asp	Arg	Ser	Cys	Ile	His	Leu
10	305					310					315					320
	Glu	Phe	Asp	Ile	Ser	Gly	Thr	Gly	Leu	Thr	Tyr	Glu	Thr	Gly	Asp	His
					325					330					335	
	Val	Gly	Val	Tyr	Ser	Glu	Asn	Cys	Met	Glu	Thr	Val	Glu	Glu	Ala	Glu
		•		340					345					350		
15	Arg	Leu	Leu	Gly	Leu	Ser	Ser	Asp	Thr	Val	Phe	Ser	Ile	His	Val	Asp
			355					360					365			
	Asn	Glu	Asp	Gly	Thr	Pro	Ile	Ala	Gly	Ser	Ala	Leu	Pro	Pro	Pro	Phe
		370					375					380				
	Pro	Ser	Pro	Ser	Thr	Leu	Arg	Thr	Ala	Leu	Thr	Lys	Tyr	Ala	Asp	Leu
20	385					390					395					400
	Leu	Asn	Phe	Pro	Lys	Lys	Ala	Ala	Leu	His	Ala	Leu	Ala	Ala	His	Ala
					405					410					415	
•	Ser	Asp	Pro	Lys	Glu	Ala	Glu	Arg	Leu	Arg	Phe	Leu	Ala	Ser	Pro	Ala
				420					425					430		
25	Gly	Lys	Asp	Glu	Tyr	Ala	Gln	Trp	Val	Val	Ala	Ser	Gln	Arg	Ser	Leu
			435					440					445			
	Leu	Glu	Val	Met	Ala	Glu	Phe	Pro	Ser	Ala	Lys	Pro	Pro	Leu	Gly	Val
		450					455					460				

Phe Phe Ala Ala Ile Ala Pro Arg Leu Gln Pro Arg Phe Tyr Ser Ile Ser Ser Ser Asn Arg Met Ala Pro Ser Arg Ile His Val Thr Cys Ala Leu Val Asn Glu Arg Thr Pro Ala Gly Arg Ile His Lys Gly Val Cys Ser Thr Trp Met Lys Asn Ser Val Pro Ser Glu Glu Ser Arg His Cys Ser Trp Ala Pro Val Phe Val Arg Gln Ser Asn Phe Lys Leu Pro Ala Asp Ser Thr Val Pro Ile Ile Met Ile Gly Pro Gly Thr Gly Leu Ala Pro Phe Arg Gly Phe Met Gln Glu Arg Leu Ala Leu Lys Glu Ala Gly Val Glu Leu Gly Ala Ala Val Leu Phe Phe Gly Cys Arg Asn Arg Ser Met Asp Phe Ile Tyr Glu Asp Glu Leu Asn Asn Phe Val Glu Ser Gly Ala Ile Ser Glu Leu Val Val Ala Phe Ser Arg Glu Gly Pro Thr Lys Glu Tyr Val Gln His Lys Met Thr Glu Lys Ala Ser Asp Ile Trp Asn Met Ile Ser Gln Gly Ala Tyr Leu Tyr Val Cys Gly Asp Ala Lys Gly Met Ala Lys Asp Val His Arg Thr Leu His Thr Ile Val Gln Glu Gln Gly Ser Leu Asp Ser Ser Lys Thr Glu Met Leu Val Lys Asn Leu Gln

Met Asp Gly Arg Tyr Leu Arg Asp Val Trp
690 695

<210> 3

5 <211> 26

<212> PRT

<213> Artificial

<220>

<223> ECPR 1056F

10 <400> 3

Gly Ala Ala Gly Gly Ala Gly Cys Thr Thr Cys Ala Cys Ala Cys Thr

1 5 10 15

Cys Cys Ala Gly Thr Ala Thr Cys Thr Gly

20 25

15

<210> 4

<211> 27

<212> PRT

<213> Artificial

20 <220>

<223> ECPR 2241R

<400> 4

Thr Cys Ala Cys Cys Ala Cys Ala Cys Ala Thr Cys Ala Cys Gly Thr

1 5 10 15

25 Ala Gly Ala Thr Ala Cys Cys Thr Thr Cys Cys

20 25

<210> 5

<211> 30

<212> PRT

<213> Artificial

<220>

<223> CNRAS1

<400> 5

Gly Gly Thr Thr Cys Thr Gly Gly Cys Ala Thr Gly Gly Gly Thr Gly

5 10 15

Cys Ala Gly Ala Gly Cys Ala Thr Cys Ala Thr Ala Gly Cys

20 25 30

10

<210> 6

<211> 31

<212> PRT

<213> Artificial

15 <220>

<223> CNRS1

<400> 6

Gly Cys Gly Cys Thr Ala Gly Thr Gly Ala Ala Thr Gly Ala Gly Ala

5 1 10 15

20 Gly Ala Ala Cys Ala Cys Cys Ala Gly Cys Thr Gly Gly Thr Cys

20 25 30

<210> 7

<211> 33

25 <212> PRT

<213> Artificial

<220>

<223> CPR2_1F

<400> 7

Gly Ala Thr Thr Cys Ala Gly Ala Ala Thr Thr Cys Thr Cys

1 5 5 10 15

Ala Cys Cys Ala Cys Ala Ala Ala Ala Cys Cys Ala Gly Ala Gly Ala
20 25 30

5 Cys

<210> 8

<211> 30

10 <212> PRT

<213> Artificial

<220>

<223> CNTGAAS

<400> 8

Thr Cys Ala Cys Cys Ala Gly Ala Cys Ala Thr Cys Ala Cys Gly Thr

1 5 10 15

Ala Gly Ala Thr Ala Cys Cys Thr Cys Cys Cys Ala Thr Cys

20 25 30

20 <210> 9

<211> 48

<212> PRT

<213> Artificial

<220>

25 <223> CPR2_1FHpaISnaBI

<400> 9

Thr Ala Gly Thr Thr Ala Ala Cys Thr Ala Cys Gly Thr Ala Ala Thr

1 5 10 15

Gly Gly Ala Thr Thr Cys Ala Gly Ala Ala Thr Thr Cys Thr
20 25 30

Cys Ala Cys Cys Ala Cys Ala Ala Ala Cys Cys Ala Gly Ala Gly
35 40 45

5

<210> 10

<211> 48

<212> PRT

<213> Artificial

10 <220>

<223> CPR2_354RAvrIIXhoI

<400> 10

Thr Ala Cys Cys Thr Ala Gly Gly Cys Thr Cys Gly Ala Gly Cys Gly

1 5 10 15

15 Gly Cys Thr Ala Thr Ala Gly Cys Thr Gly Thr Ala Gly Thr Cys Ala
20 25 30

Ala Thr Ala Thr Cys Ala Thr Cys Ala Ala Ala Ala Thr Cys Thr Cys

35 40 45

20 <210> 11

<211> 46

<212> PRT

<213> Artificial

<220>

25 <223> CPR1_1FHpaISnaBI

<400> 11

Thr Ala Gly Thr Thr Ala Ala Cys Thr Ala Cys Gly Thr Ala Cys Gly

1 5 10 15

Gly Cys Ala Cys Gly Ala Gly Cys Thr Thr Gly Thr Thr Ala Gly Thr
20 25 30

Ala Thr Cys Thr Thr Cys Thr Ala Gly Gly Gly Thr Thr Thr 35 40 45

5

<210> 12

<211> 48

<212> PRT

<213> Artificial

10 <220>

<223> CPR1_232RAvrIIXhoI

<400> 12

Thr Ala Cys Cys Thr Ala Gly Gly Cys Thr Cys Gly Ala Gly Thr Thr

1 5 10 15

15 Gly Ala Ala Gly Cys Thr Ala Cys Ala Gly Thr Thr Gly Thr Gly Ala
20 25 30

Cys Cys Ala Thr Ala Ala Thr Gly Ala Ala Ala Ala Thr Thr Gly Gly
35 40 45